# The Maine Installer

*Dedicated to Professionalism in Underground Tank Installation*

Volume 10 Issue 2 July 2003


# People and UST Systems

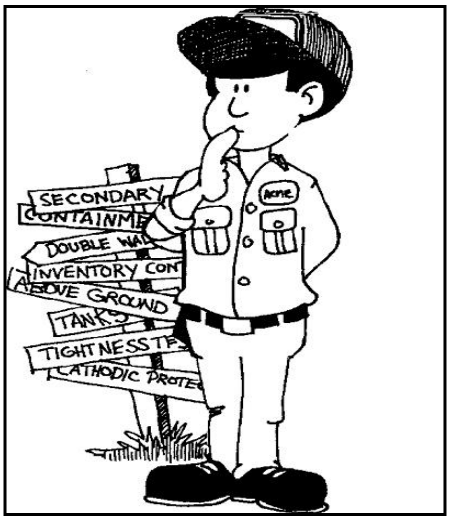
*Over drinks at business dinners, we discuss industry horror stories with associates. We shake our heads in disbelief at the ignorant, lazy -- or worse, unlawful -- behavior of people. Together we count the cost to individuals and communities, and occasionally the damage done to the environment, knowing there were opportunities to prevent the incident beforehand.*

*Human behavior plays a dominant role in our ability to manage those systems for the prevention of contamination and the protection of human health and the environment. One of my favorite dinner and wine stories is germane to this topic. It concerns a major gasoline release from the piping of an UST system caused by the tank owner's failure to search for the root cause behind an ongoing alarm on his automatic tank gauge (ATC) console.*

## A Story of System Failure via Human Error

This UST owner had a retail location that pumped a high volume of gasoline every month. He attributed years of success to an unwavering focus on his customers, resulting in a very loyal clientele. He understood that interruptions to his business were an inconvenience to his customers. Consequently, interruptions had a clear impact on his bottom line.

So, when it came time to replace his UST system, he was determined to purchase state-of-the-art equipment with the most up-to-date technology. He wanted an UST system that would allow him to operate his facility without the interruptions resulting from product releases and associated contamination.




He installed redundant backups for preventing *and* detecting releases of product. He put in double-walled tanks, double-walled piping, secondary-containment sumps for the submersibles, sensors in the sumps, and high-tech electronic line-leak detectors capable of detecting leak rates smaller than the regulatory requirement.

Unfortunately, this system had one flaw -- a flaw that would later reveal how people behave when continually

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## Inside This Issue



# Help Us Help You with Calls About Annual Inspections

Some installers do annual maintenance inspections, and others don't. Some inspectors take outside work and others don't. We're finding the ones that don't also don't want to be called by folks trying to find an inspector.

We're also hearing from tank owners and operators that they have to make an awful lot of calls to find an installer who will do their inspection.

In order to ease the burden on everybody, we're going to try to make a list of those installers who do offer inspection services. To do that, though, we have to know which installers, inspectors, and which companies would offer that service to an owner/operator in search of an inspection.

All we'd like you to do, if you want your name or your company's name on such a list is to contact us and let us know that you want to be on the list of installers offering inspection services.

If you call, please use the main number of DEP's Bureau of Remediation and Waste Management (BRWM) . That number is 207/287-2651. Ask to speak with someone from the installer certification unit (Jim Hynson or Theresa Scott. If you'd rather use email, send your note to James.R.Hynson@maine.gov. Or, if you'd like to mail your request in, send it to the Installer Certification Unit, Bureau of Remediation and Waste Management, Maine Department of Environmental Protection, 17 State House Station, Augusta, ME 04333.

We'd like to put out our first list by September 1. Thanks.

# People and UST Systems

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confronted with problems they cannot, or will not, correct.

For all of its high-tech wizardry, this UST system suffered from a common problem -- the ubiquitous leaking sump. After investing a significant sum for the "best" money could buy, the owner was surprised and frustrated to discover that these "high-tech" sumps were not watertight. The sensors in the sumps went into alarm shortly after a heavy rain. Rains were frequent at that time of the year, and after several attempts at removing the water from the sumps and resetting the alarm console, the owner and employees became indifferent to the sensor alarms. After all, it was only water.

## Trouble

As the early morning rush hour began to wind down during one blustery cold winter's day, several customers entered the store to tell the cashiers on duty that they were unable to pump regular gasoline. The owner looked at his ATG console and discovered that it had shut down the product submersible because the product line failed a gross line test. He called the contractor. Shortly after arriving at the site, the technician tried resetting the ATG system and rerunning the line test. Again, the product line immediately failed the test and the ATG system shutdown the submersible.

He decided to isolate the product line and rerun the line test to determine if the problem was with the submersible. At this time, the technician noticed a substantial amount of water in the submersible sump. The water covered the piping, entry boots, and the submersible. The owner responded that water was always getting into the sumps, but it was just water. Unable to reach the submersible because of the water and seeing that there was no gasoline on the surface, the technician isolated the product line from the dispensers and ran the line test. The product line again failed the gross line test.

The leak was probably somewhere in the product line. However, the absence of gasoline in the sub-mersible sump was bothersome because the UST system had doublewalled piping. Had there been a leak in the primary piping it should have drained back to the submersible sump. Fearing the worst, the contractor contacted the tank- and line-testing company, requesting that a tester be sent to the facility to determine whether the secondary piping was tight, and if the testing came back negative, to locate the source of the leak. The testing service supervisor informed the manager that they would be unable to perform the testing or locate any leak that might be present until the owner removed the water from the submersible sump.

## Pumping the Sump

The technician informed the owner of the need to pump the water out of the sump. The owner said that was no problem; he had a sump pump in the back office that he used to pump water out of the car wash during the last heavy rain. He could use that to pump the water out of the sump onto the driveway. The technician politely explained to the owner that that was illegal. The government classified water removed from the sump of an UST system used for storing gasoline as contaminated waste. A licensed waste hauler with the necessary equipment for pumping water from the sump and transporting it to a licensed treatment facility was required.

The owner reluctantly agreed and called the waste contractor recommended by the testing contractor. Shortly afterward, a large tanker truck arrived at the facility and began pumping the water from the sump into the tanker. Water continued entering the sump almost as fast as the tanker could pump it out. A large volume of water had collected in the tank pit during the previous months. After several hours, the tanker truck was filled to its 6,000-gallon capacity. Water no longer continued to enter the submersible sump and the testing technician was able to begin running the necessary tests.

## The Helium Test

Performing a helium test at this particular location required injecting helium into the interstitial space of the double-walled piping system through a fitting on the entry boot and waiting an hour to allow movement of the helium through the backfill. Since the helium is lighter than air, it would immediately rise toward the surface upon entering

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# Survey Reminder

We sent installers a survey a little while ago asking what training you may want regarding installing and maintaining leak detection systems. If there is enough interest in specific leak detection systems, we'll try to schedule that as part of ongoing Board approved training.

You can help us make the continuing education program more valuable to you by responding to this survey and by letting us know any suggestions you may have to plan training that is valuable and relevant to you.

If you've had any outside training which you think is relevant to your work as a tank installer or inspector, you may be able to use it to meet your continuing education requirement. Contact Jim Hynson or Theresa Scott for a continuing education application form to get credit for your training.

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the backfill wherever a hole existed in the secondary piping, causing the detector to alarm.

Using the owner's "as built" drawings as a guide, the technician chose several locations along the piping pathway to drill small-diameter holes through the concrete to get to the backfill material. The technician then placed a sensing device designed for "sniffing" helium over the holes.

The detector alarmed at the hole closest to the dispenser that was nearest the building but well outside the tank pit, confirming that there was a leak in the piping system. Excavation revealed that water from the sumps had filled the interstitial space between the primary and secondary piping. An exceptionally cold winter had caused both the ground and the water in the interstitial space to freeze.

Since freezing water expands, there was nowhere for the water to go; it burst the secondary pipe *and* crushed the primary pipe. Several hundred gallons of gasoline entered the ground because the line-leak detector had been unable to run a test for more than two hours due to the constant running of the submersible pump, which was pumping product to meet customer demand during rush hour.

## The Cost

The UST owner's significant investment in technology resulted in an invoice of thousands of dollars to locate a leak, and thousands more to clean up the underground contamination. It would be years before he would recover those costs -- all because he had not taken decisive action to properly resolve the problem of the leaking sumps.

This story, almost apocryphal in nature, shows that people play an important role in the management of UST systems. Human behavior, where it concerns the management of technology and equipment to achieve a desired outcome, requires the use of processes in order to assure success -- in this case, the prevention of gasoline releases to the underground environment from the UST system. Those processes include daily visual inspection, alarm response and notification, maintenance and repair, and periodic testing. In addition, the management of an UST system requires the investigation of incidents to identify root causes and develop solutions to prevent future problems.

## Human Error and Processes

When people use processes, there is always the potential for making mistakes. Regardless of the reasons behind their actions, the consequences can be severe. The actions of the UST owner in this story pushed technology, in this case, fiberglass-reinforced plastic, beyond its performance limits. The resultant equipment failure and malfunction of the UST system had catastrophic consequences.

Numerous studies have revealed that the dominant source of mistakes is human error. There are three common reasons for that error. Mistakes occur when people do the following:

- fail to perform required actions (e. g., removal of the water from the sumps)
- perform prohibited actions (e.g., ignoring the submersible-sump sensor alarms)
- misinterpret information (e.g., performance characteristics of containment sumps) critical for the performance of actions.

Reducing and eliminating human error is an age-old problem.

Human error can occur during the design and engineering of the equipment used in UST systems or during the manufacture of that equipment. It can occur during the construction and installation of the UST equipment or during the operation and maintenance of that equipment. It can occur because of human actions during recordkeeping of leak-detection-testing results, inventory reconciliation, or corrosion-protection testing. It can ultimately occur while responding to emergencies associated with the UST equipment or with the remediation and cleanup of releases from UST systems. Clearly, human error is something we cannot afford to ignore, especially when it can lead to the types of defects that create catastrophic results.

## Human Error and Complexity

Only in the last 20 years has it become apparent that there is a single common underlying factor linking the frequency of human error to defects (in the case of managing petroleum UST systems, the defect would be the release of gasoline to the environment). This discovery was the direct result of attempts by both the Japanese automobile and U.S. electronic industries to improve manufacturing processes in order to reduce defects in their products during the 1980s and 1990s. That single factor was complexity. According to the research, three components comprise complexity:

- objects (i.e., material, equipment, hardware, tools)
- information (i.e., data, communication, training)
- human activity (i.e., the difficulty and number of steps to perform those activities)

When we consider the complexity of UST systems in light of the need to manage human error, it is important to keep in mind the key function of those systems-to store hazardous substances and petroleum products safely, in a way that will prevent the release of product to the environment. Furthermore, if releases do occur, UST systems should be capable of detecting those releases rapidly and effectively, thus enhancing any opportunity to minimize the volume of released product. Soundly engineered, constructed, installed, operated, and maintained UST systems should continue to perform these functions effectively throughout their life cycle.

It should be apparent from my story and the research findings that UST systems are not simply comprised of equipment and technologies. Owners and operators – humans – interact with UST systems at some or all points in

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their life cycles, developing processes and procedures to manage those systems. Therefore, the core elements of all UST systems are: technology, equipment, people, and processes.

## The System Can't Do It Alone

Given the complexity of UST systems and the potential for human error, it stands to reason that we must have clearly defined, properly engineered, well-documented, consistently executed, and periodically evaluated processes. If such processes are not present, we should not expect UST systems to deliver years of reliable service, regardless of the capabilities of the technologies or the quality of the equipment.

Ongoing discoveries of contamination of public drinking water wells and land surrounding UST facilities are causing people to question concepts previously considered inviolate regarding UST technology and equipment. It is not clear whether the sources of contamination are from the upgraded equipment, the result of releases that occurred before the UST systems were upgraded, the mismanagement of UST systems, other factors such as compatibility, or a combination of several of these factors. Unfortunately, it may be several years before we can positively identify the actual root causes or sources of these problems.

Recent court settlements addressing the contamination of entire community drinking water systems with petroleum-based compounds such as MTBE and other chemicals from UST systems illustrate that these problems are immediate. The potential economic and health consequences of these releases to communities can be significant. There are several hundred thousand UST systems in operation throughout North America. Consequently, the immediate need must be to address how to manage the operation and maintenance activities of those UST systems.

How well owners, operators, and the regulatory community understand the factors affecting human error will influence how they approach solving the problems of managing UST systems. This knowledge can guide owners and operators in their selection of technology and equipment for use in new UST systems. More importantly, it can provide a framework for developing the management processes needed to ensure maximum performance from existing UST systems, particularly during their operation and maintenance.

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Likewise, this knowledge can guide the regulatory community in determining how best to regulate new and existing UST systems and in their development of any future legislation to address the operation and maintenance of UST systems. Ultimately, understanding the factors affecting human error will determine whether the decisions made by legislators and regulators contribute to the prevention of, or are among the root causes of, the contamination of our water resources.

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# Welcome Inspectors

We held our first underground oil tank inspector certification examination on June 6. Five folks passed this test and are now certified to inspect underground oil storage facilities in Maine. They are:

* Benjamin Burden, Enterprise Engineering
* Reggie Faulkingham, Gaftek of Maine, LLC
* Michael Lewis, Petroleum Maintenance Systems
* Brian McLaughlin, Dead River Co.
* Keith Perreault, Tulsa, Inc.

Welcome to the community of UST professionals in Maine.

We will offer another test on July 25 for anyone who wishes to retake it as well as for any new applicants. Since the test is difficult, we strongly recommend that new applicants file their applications and get study materials early, in time to thoroughly prepare for the exam.

# Q&A — Is manifold piping on a suction system also safe suction?

*The following question was recently received by DEP Staff:*

I'm about to work on my fifth singlewall suction siphon manifold piping quote in the last month. As you know, many operators are getting rid of the mid product by siphoning two existing compartments and blending at the island. As we discussed, on singlewall suction systems, we're quoting singlewall suction manifolds until your team makes a different call.

*The consensus answer of several DEP staff working on the question is:*

After discussing the question of tying suction lines together below grade, we have decided that two suction lines together offer the same leak detection capabilities of a standard suction system. Therefore, it is not necessary to use double wall piping as long as the following conditions are met:

A. All ball float valves must be removed.
B. The bottom of each tank must be at the same level and tanks must be of the same diameter.
C. This arrangement is limited to suction systems. The siphon line on manifolded tanks in a pressurized system (one with a submersible pump) must still have double wall piping with continuous electronic monitoring.
D. Automatic Tank Gauges cannot be used (relied upon) as the method of leak detection.
E. Owners and operators using daily inventory and statistical inventory analysis for leak detection must treat the two (or more) chambers along with all the dispensers as one system.

Our advisory opinion is based on the following points:

1. If the tank getting filled is equipped with a ball float valve, then the following situation may occur. As the fuel level neared the "full" level, the float of the ball float could rise and seat itself in the vent. Although the vapors cannot exit, compression of the vapors would not occur as quickly as they should because the pressure can be relieved through the common product piping between the two tanks. The increased pressure of the vapors would - instead of restricting and stopping the flow of fuel being dropped by the tanker truck - push fuel from the full tank to the other tank via the common piping. That tank could be overfilled. So the ball float becomes ineffective and cannot be relied upon as an overfill protection device. All ball float valves must be removed. See also the warning attached to section 6.3.3 Vent Restriction Devices in PEI/RP 100-2000, Recommended Practices for Installation of Underground Liquid Storage Systems.
2. Section 9.15 Manifolded Tanks and Siphon Piping in PEI/RP 100-2000, Recommended Practices for Installation of Underground Liquid Storage Systems requires that the bottom of the tanks be at the same level and that the tanks be of the same diameter.
3. If two tanks are manifolded with piping going from one tank to the other (what EPA calls a "syphon bar") and the fuel is delivered to a dispenser via a submersible pump and the piping is arranged so that the submersible pump will maintain a prime on the syphon bar, then double wall piping is required on the syphon bar as well as the fuel line going to the dispenser. There are leaks that can discharge fuel to the environment that go undetected with this arrangement, so double wall piping is required.
4. The added piping, the added opportunities for temperature differentials (along with the actual transfer of fuel from one tank to another through the common piping brought about by volume changes due to differences in temperature), and the long time for equalization to occur between the two tanks renders automatic tank gauges using inventory control unreliable as a source of leak detection. The differences in fuel level brought about by the above forces can mask leaks that would otherwise show up during daily inventory, the monthly reconciliation of the daily inventory, or the annual statistical inventory analysis. To our knowledge, there is no automatic tank gauge certified for use on manifolded tanks or chambers. Note this does not prohibit automatic tank gauges from being installed. They simply do not meet the requirements of leak detection.

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# The Maine Installer

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**c/o ME Department of Environmental Protection**
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## Federal Underground Tank Bill Passes Senate

By unanimous consent, the U. S. Senate passed the Underground Storage Tank Compliance Act of 2003 (S. 195) on May 1. The bill was subsequently referred to the House Committee on Energy and Commerce on May 15, and the Subcommittee on Environment and Hazardous Materials on May 20. It continues to wait for House action.

In addition to modifying the protocol for dispensing Federal underground tank funds, the bill would provide at least two important mandates for State programs, such as the one in Maine.

First, the legislation would require the U.S. Environmental Protection Agency (EPA) to develop guidelines for operator training, and the States (read Maine) to implement operator training programs in the near future.

Second, the bill would provide a Federal mandate for periodic underground tank inspections, such as the program we are beginning to implement here in Maine.

The complete text of the bill can be found on the U.S. Senate's internet web site. That site also provides information on the status of the bill, both in the Senate and in the House. That internet web site is www.senate.gov.


## Q&A

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5. If daily inventory and statistical inventory analysis is used as the leak detection method, the common chambers, piping and dispensers must be considered as one. This is easy enough to do. However, should the results of daily inventory, monthly reconciliation, or statistical inventory analysis present evidence of a leak, then ALL of the tanks or chambers and piping must be tested to see if a leak exists. The added expense of testing more than one chamber can be significant. This fact should be explained to the owners and operators of the tank.

Thanks to you and your customers for using suction systems.